Continuous Production of Carbon Nanotubes - A Review.

ABSTRACT

Carbon nanotubes (CNTs) up to now are the most researched materials of the 21st century with an international intention of growing industrial quantities due to their superior properties for use in many applications. Thus far large quantities of carbon nanotube scan be grown in a continuous manner by both arc as well as chemical vapour deposition methods. In this paper, an innovative approach of feeding gases, a carbon precursor (solid or gases) and a catalyst into the reaction zone is reviewed. This is followed by a study of the reaction process concerning how the method is initiated, the effect of growth environment and catalyst on CNTs as well as the discharging mechanism for the final carbon products. A study of the arc method consists of a novel way of growing CNTs in a liquid solution from an arc discharge generated by carbon rods, by growing CNTs in a plasma zone using carbon gases or solid carbon and a more direct method of using carbon tape as the anode for the synthesized source are also reported. In the case of the chemical vapour deposition (CVD) method, some use a horizontal reactor and some use a vertical reactor with all having different installed devices for use in continuous feeding and discharging of resources and products respectively. Additionally, problems regarding the CNT yield and some issues that have not been taken into consideration by others, are discussed. At the end of the review, an additional mechanism to integrate catalyst preparation and carbon nanotube purification into the current research synthesizing process for future study is proposed for a highly productive continuous CNT synthesis process.

Keyword: Carbon nanotubes; Fluidized bed; Chemical vapour deposition; Continuous CNT synthesis